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Surgical treatment of chronic pancreatitis with pancreatic main duct dilatation: Long term results after head resection and duct drainage

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Abstract

Tissue and duct hypertension is considered as a major factor in the etiology of pain in patients with chronic pancreatitis (CP). Duct dilatation is a consequence of duct obstruction due to scars or duct stones. Nevertheless, the procedure of choice, drainage or resection, is still under discussion. We present long-term results of patients operated with duodenum-preserving pancreatic head resection (DPPHR) combined with a Partington-Rochelle duct drainage in cases of chronic pancreatitis with multiple stenosis and dilatation of the side ducts.

Methods and patients. From April 1982 to September 2001, in 55 out of 538 patients with chronic pancreatitis, a DPPHR with additionally Partington-Rochelle duct drainage was performed (44 male, 11 female, mean age 45.8 years). Ninety-two percent of the patients suffered from alcoholic pancreatitis. Medical respective pain treatment for chronic pancreatitis was in median 64.5 months prior to surgery. The indications for surgery were in 87% pain, 59% of the patients had an inflammatory mass in the head of the pancreas, 36% a common bile duct stenosis and 5% a severe stenosis of the duodenum. The endocrine function (OGGT) was impaired in 79% of the patients preoperatively.

Results. Hospital mortality was 0%, postoperative complications occurred in 11 patients. Follow-up: All except 2 patients were followed up in the outpatient clinic with the mean follow-up time of 69.7 months (8–105 months), the late mortality was 9%. Sixty-eight percent of the patients were completely free of pain, 29% had occasional pain, 3% suffered from a further attack of pancreatitis. Body weight increased in 79%, 58% were professionally rehabilitated. Late postoperative endocrine function was unchanged in 85% (improved in 5%, deteriorated in 10%).

Conclusion. The pain control in patients with multiple duct stenosis after duodenum-preserving pancreatic head resection with duct drainage leads to long-standing absence of pain and low recurrence rate of attacks of pancreatitis.

Key Words: *Chronic pancreatitis, duodenum-preserving pancreatic head resection, Partington-Rochelle*

Introduction

Chronic pancreatitis is a disease of progressive inflammation of the exocrine tissue, which is caused in Western countries mainly by continuous alcohol abuse. According to a recently established hypothesis, chronic pancreatitis results from relapsing acute pancreatitis that causes interstitial acinar and fatty tissue necrosis, inducing a perilobular fibrosis, and consequently results in stenoses and dilatations of the pancreatic main duct. In about 30%–50% of the patients with chronic alcoholic pancreatitis an inflammatory mass in the head of the pancreas develops, leading to a head enlargement. Besides local complications (such as stenosis of the pancreatic main duct, the common bile duct or the duodenum) the area of inflammation leads to a pancreatitis-specific neuritis which contributes to the clinical pain syndrome via local release of pain hormones, such as substance P and CGRP [1,2].

Drainage operations are performed as a lateral side-to-side pancreaticojejunostomy, first described by Partington and Rochelle [3]. The combination of drainage operations with distal pancreatectomy as described by Puestow and Gillesby [4] has been abandoned because of the disadvantage of an unnecessary pancreatic left resection. In the Partington-Rochelle procedure the main duct is incised longitudinally over its full length and anastomosed with a Roux-en-Y jejunal loop. The disadvantage of this procedure is that the inflammatory mass of the pancreas is not treated.

In this study we present our long-term results of patients operated with duodenum-preserving

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pancreatic head resection (DPPHR) combined with a Partington-Rochelle duct drainage in cases of chronic pancreatitis with multiple stenosis and dilatation of the side ducts.

Patients and methods

Between April 1982 and September 2001, 538 patients with chronic pancreatitis (CP) were operated with a duodenum-preserving pancreatic head resection. In 55 of 538 patients a modification according to Partington-Rochelle was performed for multiple stenosis and dilatation of the pancreatic main duct (DPPHR + PR), 483 patients out of 538 were treated with a DPPHR alone (DPPHR). The DPPHR-group of 483 patients consisted of 382 men and 101 women with a mean age of 46.3 years (range 18–74 years). Of the 55 patients (DPPHR + PR), 44 patients were male, 11 female, the mean age being 45.8 years (range 20–73 years). Pain was measured by using the visual analog scale (VAS). The diagnosis of CP was made using the case history data, exo- and endocrine function tests, data of imaging procedures and the intra-operative findings as well as the histological investigation of operative specimens. To evaluate the late outcome, clinical data, endocrine and exocrine function tests as well as the pain status were assessed pre- and postoperatively. For measurement of the endocrine function an oral glucose tolerance test (OGTT) and for the exocrine function a pancreolauryl test (PLT) were carried out.

Preoperative morbidity

The mean duration of the disease since diagnosis was 64.5 months (DPPHR + PR) and 49.5 month (DPPHR), respectively. Pain was the leading clinical symptom of the majority of the patients: 93% (DPPHR + PR) and 87% of the patients (DPPHR), respectively. The etiology of pancreatitis was alcohol consumption in 92% for patients treated with DPPHR + PR and 84% for those with DPPHR alone. The rate of attacks of pancreatitis since diagnosis was similar for both groups of patients with 5.2/patient (DPPHR + PR) and 5.5/patient in median. Previous interventional treatment with placement of stents were reported by 16% (DPPHR + PR) and 31% (DPPHR) of the patients. Thirty-one percent and 29% of the patients had surgical treatment for chronic pancreatitis prior to DPPHR (Table I). In terms of the exocrine function a pathological PLT-test was observed in 78% of the patients with CP. Preoperative evaluation of the endocrine function using the oral glucose tolerance test showed an impaired glucose metabolism in 46% of the patients; 33% of the patients were in the state of insulin-dependent diabetes; 21% of the patients were in the normal range of glucose metabolism (Table IV).

Table I. CP with and without pancreatic main duct dilatation—preoperative morbidity (538 patients*)

	DPPHR** 483 patients	DPPHR + PR*** 55 patients
Duration of disease (months)	49.5	64.5
Pancreatitis periods (years/patient)	1.5	2.2
Peroperative surgical procedures	29%	31%
Stent common bile duct	26%	13%
Stent pancreatic main duct	5%	3%

* April 1982–September 2001 Department of General Surgery, University of Ulm, Germany.
** DPPHR: Duodenum-preserving pancreatic head resection.
*** DPPHR + PR: Duodenum-preserving pancreatic head resection with Partington-Rochelle modification.

Preoperative and intra-operative assessment

Endoscopic retrograde cholangiopancreatography (ERCP) revealed common bile duct stenosis in 36% of the patients; 18% had a cholestasis. Of the patients with CP, 59% displayed an inflammatory mass in the head of the pancreas (IMH). Five percent of the patients showed a duodenal stenosis due to enlargement of the pancreatic head. Other morphological alterations in the pancreatic tissue was observed as follows: calcification 54%, duct stones 49%, pseudocystic lesions 46% and areas of focal necrosis 15%.

Late follow-up

All except two patients were followed postoperatively in the out-patient clinic. Five patients died in the follow-up period due to: cardiac arrest (2 patients), necrotizing pancreatitis (1 patient) and unknown reasons (2 patients). Two patients were lost for follow-up. The mean follow-up rate for the late follow-up was 69.7 months (range: 8–105 months). The data presented in the late follow-up are based on the recent evaluation using the case history, the data from the exocrine (PLT) and endocrine function tests (OGTT) as well as the pain status.

Statistics

The statistical evaluation was performed using the McNemar and the Wilcoxon test. $p < 0.05$ was considered as significant difference.

Results

DPPHR with additional pancreatic main duct drainage was applied to all 55 patients in the technique as described elsewhere [5,6]. The wet weight of the operative specimen figures between 25 g and 45 g.

An internal drainage of the common bile duct, as described elsewhere, due to a stenosis in the intrapancreatic segment as well as a cholecystectomy was performed in 31% of the patients [5,6]. In two patients with a duodenal stenosis a decompression of the

Table II. CP with pancreatic main duct dilatation—early postoperative results (538 patients*)

	DPPHR** 483 patients	DPPHR+PR*** 55 patients
Postoperative hospitalization (days)	13.9 (7–124)	14.5 (7–46)
Early postoperative morbidity	18%	20%
Re-operation	6%	9%
Hospital mortality	0.8%	0%

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** DPPHR: Duodenum-preserving pancreatic head resection.
*** DPPHR+PR: Duodenum-preserving pancreatic head resection with Partington-Rochelle modification.

duodenum was sufficient for restoration of the food transit.

Early postoperative course

The mean postoperative hospitalization time was 14.5 days (range: 7–46 days). Early postoperative morbidity occurred in 11out of 55 patients (20%); we observed bleeding (3 patients), pancreatic fistula (3 patients), pleural effusions (4 patients), cardiopulmonary dysfunction (3 patients), intra-abdominal abscess (2 patients) and sepsis (1 patient); 5 out of 55 patients (9%) had to be re-operated because of intra-abdominal abscess (1 patient), sepsis (1 patient), bleeding (1 patient) and anastomotic leakage (2 patients). Hospital mortality was 0% (Table II). Concerning the endocrine function, as assessed by the OGTT, no significant change was seen (data not shown). In terms of the exocrine function, all patients received a substitution with pancreatic enzymes because of an ongoing exocrine functional impairment.

Late postoperative status

The follow-up period of the 48 patients was 69.7 months in median with a range of 8–105 months. Five patients died in the late follow-up, the late mortality being 9%. Five percent of the patients were rehospitalized due to periods of pancreatitis. None of the patients needed a re-operation.

In terms of pain status in the long-term follow-up 68% of the patients were completely pain-free, the need for analgetic treatment dropped from 64% preoperatively to 5% postoperatively. In terms of pain as well as concerning attacks of pancreatitis, the decrease of the number of patients was significant from preoperative to postoperative ($p < 0.002$) (Table III). In terms of endocrine status, 32% of patients remained in a normal glucose status; 68% patients showed an impaired glucose status, 31% with impaired glucose tolerance test and 37% with insulin-dependent diabetes mellitus. The change in endocrine function (preoperative to postoperative) was not significant (Table IV). In terms of quality of life, 58% of the patients were professionally rehabilitated; 32% were retired. The body weight was increased in 38 out of 48 patients (79%); 32% of the patients still drank alcohol (Table V).

Table III. CP with pancreatic main duct dilatation—pain status after surgery (55 patients*)

	Preoperative* 55 patients	Late postoperative** 48 patients
Pain status:		
Daily	39%	3%
Occasionally	48%	29%
No pain	13%	68%***
Attacks of acute pancreatitis	53%	5%***
Analgetic treatment	64%	5%***

* April 1982–September 2001 Department of General Surgery, University of Ulm, Germany.
** late postoperative follow-up: 53/55 patients (mean follow-up: 69.7 months (8–105 months)).
*** $p < 0.002$ (McNemar) preoperative versus postoperative.

Discussion

The surgical approach to management of chronic pancreatitis has changed during the last decades mostly due to an increase in understanding of the pathophysiology of the disease. This led to a decrease of drainage procedures and an increase of parenchymal resections mostly in the pancreatic head. The most important factors for this changing approach to surgical management in chronic pancreatitis may be the better understanding of pathophysiology of pain and the reduction of morbidity and mortality of the resective procedures in pancreatic surgery [5,7–9]. Two hypotheses contribute to the severe pain syndrome in chronic pancreatitis. It could be demonstrated that sensory nerves in the area of inflammation are enlarged in diameter and showing a loss of their perineural sheath and infiltration of inflammatory cells [1]. The pancreatitis-specific neuritis has been found to contribute to the clinical pain syndrome via local

Table IV. CP with pancreatic main duct dilatation—endocrine status (55 patients*)

	Preoperative 55 patients	Late postoperative** 48 patients
OGTT normal	21%	32%
OGTT impaired	46%	31%
IDDM	33%	37%

* April 1982–September 2001 Department of General Surgery, University of Ulm, Germany.
** late postoperative follow-up: 53/55 patients (mean follow-up: 69.7 months (8–105 months)).

Table V. CP with pancreatic main duct dilatation—quality of life after surgery (55 patients*)

	Late postoperative** 48 patients
Pain free	68%
Professional	
rehabilitation	58%
retired	32%
Increased body weight	79%
Enzyme supplementation	72%
Alcohol intake	32%

* April 1982–September 2001 Department of General Surgery, University of Ulm, Germany.
** late postoperative follow-up: 53/55 patients (mean follow-up: 69.7 months (8–105 months)).

liberation of pain hormones like substance P and CGRP (*2*). A second hypothesis suggests that the progressive fibrosis leads to increased pressure in both pancreatic ducts and tissue, which may lead to a kind of pancreatic compartment syndrome due to reduced blood flow [10–13]. Nevertheless, anatomical, embryological and pathomorphological findings point to the head of the pancreas as a pacemaker of the disease, as postulated by Beger [19] and Longmire [14]. Regarding the tissue mass of the normal pancreas, the pancreatic head including the neck up to the portal vein covers approximately 50% of the pancreatic tissue. Furthermore the head of the pancreas covers two different embryological parts of the pancreas, the dorsal and the ventral pancreas, which might influence the pathomorphology in the pancreatic head. The double duct system including the duct of Santorini and the duct of Wirsung is of clinical relevance to the pathomorphology of pancreatic inflammation. Particularly the experience with pancreas divisum demonstrates that anomalies of the pancreatic duct system in the head of the pancreas sometimes lead to an inflammatory process predominantly in the head due to obstruction of the pancreatic juice and generation of local inflammatory process [15,16].

The most common drainage procedure is the side-to-side pancreaticojejunostomy as described by Partington-Rochelle [3]. However, a number of patients are suffering from additional problems due to an inflammatory mass in the head of the pancreas, e.g. common bile duct stenosis, duodenal stenosis, and vascular stenosis with compression of the portal vein and portal hypertension. Consequently, long-term results of drainage procedures are rather discouraging. Whereas early postoperative results were good, they had deteriorated during the following 5 years to 55% good or fair pain relief [17]. In contrast to these results, the patients presented in our series had a significant improvement concerning their pain status in the long-term follow-up. The proportion of patients who were completely free of pain was 68% after a median follow-up of 5.8 years. The need for analgetic treatment dropped significantly from 64% before operation to 5% in the late follow-up. According to this, the number of patients who suffered from attacks of acute pancreatitis was reduced from 55% to 5% (preoperative versus late postoperative). These data indicate that the combination of local resection and duct drainage may result in a slow-down of the progression of the disease. Markowitz *et al.* [18] evaluated the reasons for failure in 15 consecutive patients 5 months after a Partington-Rochelle operation. They re-operated on 14 out of 15 patients (13 head resections, 1 left resection) and followed them up for a median of 39 months. During this follow-up, 10 patients became pain-free and 2 died of pancreatic cancer which had been overlooked during the Partington-Rochelle operation. The reasons for failure of the Partington-Rochelle procedure, according to the authors, were: pancreatic cancer, inadequate duct decompression, biliary stenosis and inflammation of the head of the pancreas. In summary, the single use of a drainage operation is limited to patients without inflammatory mass in the pancreatic head, but with dilatation of the main pancreatic duct.

The Frey procedure has been introduced primarily as a drainage procedure with an additional minor resection of part of the pancreatic head and is therefore a modified Partington-Rochelle procedure which leaves the major part of the inflammatory mass in the pancreatic head. In contrast to DPPHR with a weight of the resected tissue of about 25–45 g, the Frey procedure is a coring out of part of the pancreatic head with an average specimen weight of less than 6 g [8]. Consequently this procedure is not effective against cholestasis, because the resection is not appropriate to decompress the common bile duct in the intrapancreatic segment.

The pathomorphological changes of CP are developing in the duct system in the pancreatic head. On the basis of computed tomography-investigations, 59% of the patients of this series demonstrated an inflammatory mass in the head of the pancreas. Pseudocystic lesions in 46%, and biliary stenosis in 36%, underline that the pancreatic head is the leading area in this type of CP. Therefore an appropriate resection of the pancreatic head is indicated.

In terms of endocrine function after DPPHR, recent studies could demonstrate a preservation of the glucose metabolism [19,20]. It could be shown, that the anti-insulinary hormones glucagon and somatostatin are reduced [21]. In this series there was a tendency towards an improvement in the number of patients with normal endocrine function from 21% to 32% (preoperative versus late postoperative). However, the changes in endocrine function between the groups of patients with normal or impaired glucose metabolism showed no statistically significant changes (Table IV). Lankisch *et al.* observed a normal endocrine function in alcoholic CP in only 17% of the patients; 81% of the patients had moderate or severe endocrine insufficiency [22].

In terms of quality of life, 79% of the patients showed a significantly improved body weight. Fifty-eight percent of the patients were able to return to work, 32% had already retired. Nevertheless, 10% of the patients in the follow-up were still unable to return to work.

After DPPHR the death rate was 9% in a mean observation time of 5.8 years. In studies with a comparable observation time the death rate was between 20% and 35% [22–24]. In two studies following lateral pancreaticojejunostomy for CP, the death rate was reported at 21% and 26%, respectively [17,25]. The death rate was considered to be caused by continuing alcohol abuse or late complications in more than 50% of the patients [17]. In comparison to subtotal resection of the pancreatic head, drainage procedures bear the risk of overlooking a malignant lesion [26,27]. Lucas *et al.* [28] reported a death rate of 8% (10 patients), whereas at least 6 patients (5%) died of pancreatic cancer. Haas *et al.* [29] reported an increased frequency of pancreatic cancer after pancreaticojejunostomy. This cancer was far advanced in all cases. Lowenfels *et al.* [30] noted in multi-center study an increased risk of developing pancreatic cancer in chronic pancreatitis patients. Regarding the significant association between alcoholic chronic pancreatitis and pancreatic cancer, DPPHR may have a preventive effect in terms of the development of pancreatic head cancer in patients with inflammatory mass and pancreatic main duct dilatation.

Conclusion

Upper abdominal pain and pancreatitis attacks are the leading symptoms of patients suffering from CP with pancreatic main duct dilatation. The most common drainage procedure is the side-to-side pancreaticojejunostomy as described by Partington-Rochelle which is designed for patients with duct dilatation without additional problems due to an inflammatory mass in the head of the pancreas, e.g. common bile duct stenosis, duodenal stenosis, and vascular stenosis with compression of the portal vein and portal hypertension. That may be one reason, why long-term results of drainage procedures are rather discouraging. Whereas early postoperative results are good, they deteriorate during the following years. In contrast to these results, the patients presented in our series had a significant improvement concerning their pain status in the long-term follow-up. The number of patients who were completely free of pain was 68% after a median follow-up of 5.8 years. The number of patients who suffered from attacks of acute pancreatitis was reduced from preoperatively 55% to 5% postoperatively. These results indicate that the combination of local resection and duct drainage may result in a slow-down of the progression of the disease. Duodenum-preserving pancreatic head resection furthermore preserves the endocrine function in the early and late postoperative course. The duodenum-preserving head resection has a low early and late morbidity and surgical-related mortality. In comparison to drainage procedures in CP, subtotal resection of the pancreatic head minimizes the risk of overlooking a malignant lesion. DPPHR should be the surgical procedure of choice in patients with multiple duct stenosis regarding the favourable short-term and beneficial long-term outcome.

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